

book like this are to expose the reader's weaknesses in knowledge, to promote further reading, and to clarify certain concepts that are perhaps remembered but not well understood. The questions and answers in this book meet those goals as they cover the scope of concepts and principles that are tested by the Interventional Cardiology Board Examination. Interventional cardiology fellowship trainees who are preparing for the certification examination, as well as practicing physicians who wish to review and test their knowledge, will find this book useful.

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King of Hearts: The True Story of the Maverick Who Pioneered Open Heart Surgery

G. Wayne Miller. 352 pp. New York, New York: Times Books, 2000. US \$25.00. ISBN 0-8129-3003-7

Because he pioneered a direct approach to open heart operations in the 1950s, Clarence Walton Lillehei (1918-1999) may justifiably be called the "father of open heart surgery." With respect to the large number of innovative techniques and concepts that he introduced, Dr. Lillehei can be compared to an earlier renowned surgical pioneer, Alexis Carrel (1873-1944). Both men were creative geniuses whose colorful, controversial reputations eventually offended the medical establishment. Nevertheless, their surgical innovations yielded incalculable humanitarian benefits.

Dr. Lillehei pioneered not only open heart surgery but also pacemaker and cardiac valve technology. A native of Minneapolis, he helped establish that city as a center of medical technology and clinical excellence. He had originally planned to follow in his father's footsteps and become a dentist. Upon enrolling at the University of Minnesota, however, he found that the requirements for medicine were similar to those for dentistry, so he entered medical school. His surgical residency was completed under the direction of Owen Wangenstein, chairman of the University of Minnesota's department of surgery from 1931 to 1967. Wangenstein was responsible for producing many brilliant surgeons, and Walt Lillehei soon became the department's brightest young star.

By 1950, Dr. Lillehei was a full-time member of the surgical faculty at the University of Minnesota Medical School and was beginning to work his way up the academic ladder. That same year, however, he was diagnosed with lymphosarcoma of the parotid

gland and was given only a 10% chance of surviving for 5 years. After undergoing extensive head and neck surgery (which left him with a permanent physical disfigurement) and radiation therapy, he resumed his surgical career in late 1950.

Turning his attention to heart surgery, Dr. Lillehei was fascinated by the possibility of repairing complex intracardiac birth defects, which at that time usually meant an automatic death sentence for young children. Before such repairs could be feasible, surgeons had to find some way to support the patient's circulation while the heart was stopped and opened. In 1953, John Gibbon, of Philadelphia, used a complex heart-lung machine with a screen oxygenator and roller pumps to correct an atrial septal defect. This approach entailed so many complications, however, that Gibbon became discouraged and discontinued its use. Alternatively, Dr. Lillehei and his associates introduced "cross-circulation," a method originally used in the experimental laboratories. In this approach, the patient was connected to a human "donor" (preferably a parent), who served as a living oxygenator. In 1954-55, Lillehei used this method to repair 45 hearts with complex intracardiac defects.

Because cross-circulation was risky to the donor and because of other ethical and practical considerations, it was never widely adopted. In 1955, Lillehei and Richard DeWall introduced a better option—the first clinically successful bubble oxygenator. This remained the preferred cardiopulmonary bypass device for the next quarter of a century. In the mid 1950s, Dr. Lillehei helped pioneer hemodilution and moderate hypothermia for open heart surgery. With these techniques, a wide array of intracardiac problems became amenable to the surgical scalpel. In 1957, Lillehei and Earl Bakken (an electrical technician at the hospital and later cofounder of Medtronic), introduced the first transistorized, wearable permanent cardiac pacemaker. Dr. Lillehei also designed several heart valve prostheses, including the Lillehei-Kaster and St. Jude Medical valves.

Unfortunately, at age 55, Dr. Lillehei began to lose his vision (a late complication of his irradiation for cancer), and he retired from surgery for personal reasons. Nevertheless, he remained available as a lecturer, writer, and consultant. From 1979 until his death in 1999, he served as medical director of the St. Jude Medical Heart Valve Division.

Dr. Lillehei was widely admired for his surgical ingenuity, imagination, and boldness. Because he flouted tradition and led a flamboyant, reckless personal life, he was also widely criticized, especially after being convicted of income tax evasion in 1973. Nevertheless, he could show true greatness of soul, especially to his patients, who praised his warmth, affability, compassion, and generosity.

Over the years, Dr. Lillehei influenced hundreds of trainees in thoracic surgery, who spread his educational legacy around the world, introducing major advances in almost every area of cardiac diagnosis and treatment. As a young surgeon myself, I traveled to Minneapolis to observe Dr. Lillehei's work, both with cross-circulation and with the DeWall-Lillehei oxygenator. Later, my colleagues at the Texas Heart Institute and I built a stainless-steel oxygenator, which enabled us to establish a productive open heart surgery program. Over the years, Walt Lillehei and I became and remained good friends. I have always been grateful for his influence on my early career.

Because of this friendship, I took special pleasure in reviewing *King of Hearts*, which is not only a moving biography of a complex, controversial hero, but also a dramatic chronicle of the founding of open heart surgery. The book may be read on several levels—as a medical thriller, a historical record, or a fascinating personality study. Indeed, in its grand themes of life and death, power and temptation, it is reminiscent of a Greek tragedy whose hero represents humanity itself, vulnerable to flaws and errors in judgment.

Aimed at a lay audience rather than at medical professionals, *King of Hearts* will be enjoyed by all who relish a gripping narrative. Some readers may find its style rather melodramatic, but that is a subjective matter, and it may even enhance the book's appeal for other readers. The book includes 17 photos of Dr. Lillehei, his patients, and his associates. Meticulously researched and referenced, it is a fascinating tribute to the human spirit, not only of this intrepid surgeon but also of his young patients and their parents. Friends and admirers of Dr. Lillehei will be especially pleased at this well-balanced, sympathetic portrayal of his life and work.

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Cardiac Assist Devices

Daniel J. Goldstein, Mehmet Öz. 464 pp. Armonk, New York: Futura Publishing Company, Inc., 1999. US \$115. ISBN 0-87993-449-2

Cardiac Assist Devices by Drs. Daniel J. Goldstein and Mehmet C. Öz is a timely new book that describes the evolution and application of the new devices that have been developed to augment or replace the function of the failing heart. The book focuses on the left ventricular assist device (LVAD). This is the most widely used device now, and will probably con-

tinue to be the primary heart assist device in the future.

The book is timely because the devices it describes seem destined to revolutionize the treatment of patients whose condition has left them with virtually no option. Many researchers have predicted that the new generation of devices will begin to replace transplantation, perhaps in the next 5 to 7 years, a development that would be of tremendous importance as the availability of donated organs continues to dwindle in comparison with the number of patients who need them.

The book is divided into 3 sections. Part 1 begins with a chapter that provides historical perspective on the evolution of mechanical circulatory support. Subsequent chapters discuss various aspects of the use of these devices, including patient selection; assessment and management of complications (primarily during the perioperative period, when most complications occur); the concept of "bridge to recovery"; and economic issues. There is also a chapter that covers the basic-science concepts underlying the hemodynamics and immunologic processes associated with the blood-device interface.

The 9 chapters of Section 2 describe the currently available devices and consider their respective strengths and weaknesses. Future devices, many of which are already in human trials, are also discussed. Most exciting of these are the axial flow devices, which are completely portable and hold great promise for resolving many of the severe complications encountered with the currently available devices.

The concept of bridge to recovery, in which the LVAD is used to support the failing heart for a period of months until it recovers, is now receiving intensive investigation and should gain acceptance within the next few years as a treatment for patients whose cardiomyopathy is potentially reversible. This promising development is mentioned in the book, but it should have received more emphasis and wider discussion.

Another limitation of the book is that it does not adequately discuss which devices are best for which patient populations, nor does it offer advice to physicians and administrators of an institution for choosing which mechanical circulatory support capabilities will best suit their facilities. Despite these flaws, *Cardiac Assist Devices* fills an important need by covering a fast-growing field in cardiac medicine and surgery.

The audience for this book should include cardiac surgeons, cardiologists, administrators of institutions that are interested in developing cardiac assist capabilities, and researchers in the field of heart failure. Assist device technology holds great promise, both for improving quality and length of life in heart fail-